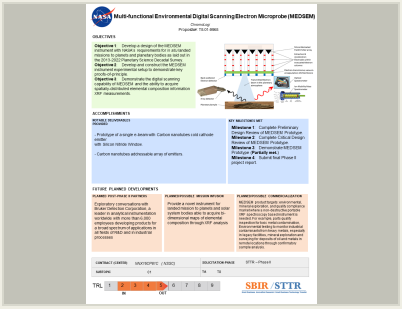
Small Business Innovation Research/Small Business Tech Transfer

Multifunctional Environmental Digital Scanning Electron Microprobe (MEDSEM), Phase II

Completed Technology Project (2016 - 2018)

Project Introduction

Chromologic (CL) and the California Institute of Technology (Caltech) propose to continue the Phase II STTR development and demonstration of a Multifunctional Environmental Digital Scanning Electron Microprobe (MEDSEM) instrument that transmits high energy beams of electrons sequentially using a two-dimensional array of multiple, miniaturized electron probes into a planetary atmosphere and strike solid or liquid planetary surfaces to simultaneously generate a wealth of spatially-mapped compositional information. MEDSEM will ultimately simultaneously measure X-ray Fluorescence (XRF), Backscattered Electron (BSE) Spectra, Optical Spectra (OS) and Mass Spectra (MS). During the Phase II project Caltech will build on its transfer of electron-transmissive membrane technologies (Phase I) and further transfer to CL the technology for building an array of miniaturized, high-energy electron optic columns (EOCs) that are encapsulated by the microfabricated, electron-transmissive membranes for exciting XRF from samples in an atmospheric ambient. Electron field-emitter sources for these columns will be procured by Caltech from Stellarray Inc. and integrated with the high-energy electron columns. CL will manage the overall STTR Phase 2 project and assist Caltech in the fabrication and integration of EOCs, perform electron-optical and XRF-generation computer simulations to optimize the MEDSEM design, lead the testing and characterization of the Phase II MEDSEM prototype, and ultimately demonstrate the MEDSEM prototype performance. The 24-month Phase II effort will be aimed at developing and demonstrating a prototype MEDSEM prototype instrument (TRL6). The MEDSEM prototype will be capable of generating high-energy electron beams (10-30 keV), transmitting them into the atmospheric ambient and generating characteristic XRF from suitable planetary mineral sample analogs.



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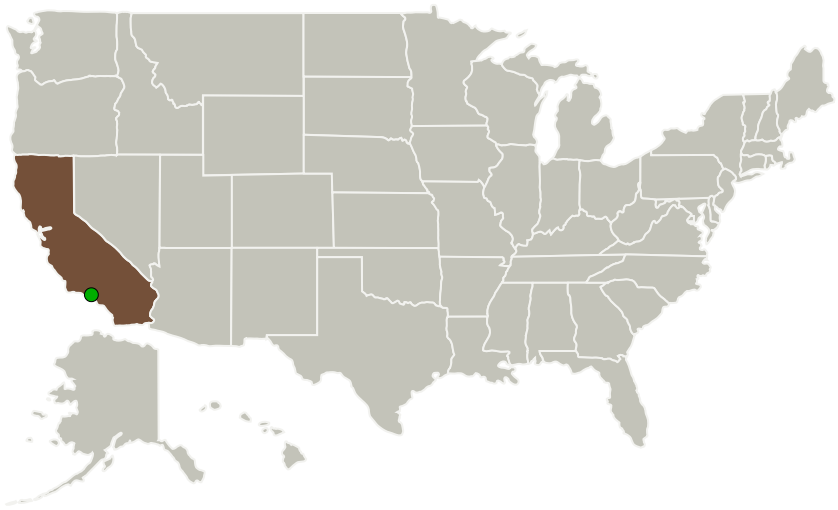
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
ChromoLogic, LLC	Lead Organization	Industry Minority-Owned Business	Monrovia, California
California Institute of Technology(CalTech)	Supporting Organization	Academia	Pasadena, California
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Project Transitions

September 2016: Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

ChromoLogic, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

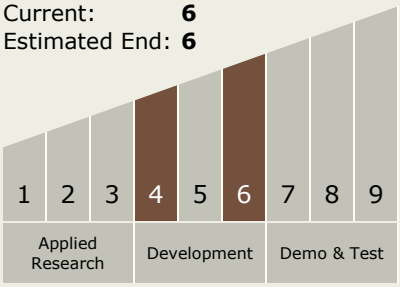
Carlos Torrez

Principal Investigator:

Virgínio Sannibale

Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



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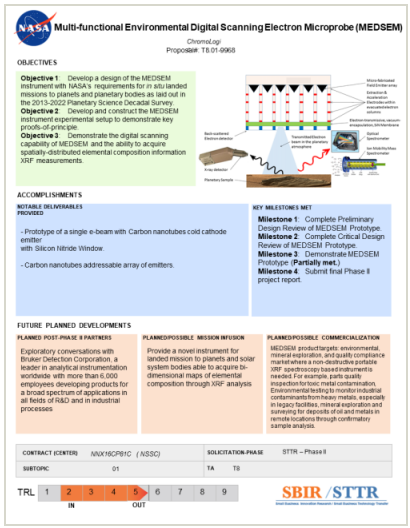
September 2018: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140791)*

Images

Briefing Chart Image
Multifunctional Environmental Digital Scanning Electron Microprobe (MEDSEM), Phase II *(https://techport.nasa.gov/image/125971)*



Final Summary Chart Image
Multifunctional Environmental Digital Scanning Electron Microprobe (MEDSEM), Phase II *(https://techport.nasa.gov/image/132892)*

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.5 Lasers

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System